"Kim reference").

The Kim reference purportedly concerns a modified semiconductor laser diode having an integrated temperature control element. See Title. The Kim reference refers to its diode arrangement as having at least one laser chip, heating provided by at least one PTC resistor such that a device operational temperature is controlled by this PTC resistor, a detector for determining the radiation emerging from the rear of the laser chip, an NTC resistor or a thermo-element for measuring the chip temperature. See Abstract. The Kim reference further refers to the laser chip as serving a dual function of acting as a laser source and as a radiation detector. See Abstract. Figure 1(a) of the Kim reference is referred to as having a miniaturized PTC (a posistor utilized as heat and/or control element) brought into thermal contact with the laser chip – in comparison to conventional laser diodes, the PTC replaces the employed "mounting column" on which the laser chip usually is mounted and which usually acts as a heat sink. See col. 2, lines 21-23 and 45-50.

Claim 16, as now rewritten, recites:

> A semiconductor laser comprising:
>
> a semiconductor laser chip; and
>
> at least one temperature sensor configured to be integrated in the semiconductor laser chip for measuring an operating temperature,
>
> wherein the at least one temperature sensor is secured by welding directly in the semiconductor laser chip, an energy for the welding coming from a light source, the light source including at least one of a ND-glass source, a Nd-YAG source and a source having a similar spatial distribution and similar spectral distribution to a Nd-glass source or a Nd-YAG source.

In contrast, the Kim reference does not identically disclose (as it must for anticipation) at least the features of a semiconductor chip with at least one temperature sensor configured to be integrated in the semiconductor laser chip for measuring an operating temperature, wherein the at least one temperature sensor is secured by welding directly in the semiconductor laser chip, an energy for the welding coming from a light source, the light source including at least one of a ND-glass source, a Nd-YAG source and a source having a similar spatial distribution and similar spectral distribution to a Nd-glass source or a Nd-YAG source, as in claim 16. In fact, the Kim reference concerns using a PTC resistor, or posistor, as a heating element so that the temperature of the laser chip is "heated" to a value above the ambient temperature – a temperature value which cannot be reached solely by heating the laser chip by means of the flow of the operational current. See col. 2, lines 24-28. The Kim reference further refers to using the PTC resistor as a control element; in this event, the laser chip heats the PTC to its

operational temperature whereas the PTC only serves to control this temperature. See col. 2, lines 29-32. In claim 16 of the present above-identified application, at least one temperature sensor is configured to be integrated in the semiconductor laser chip for *measuring* an operating temperature, and the at least one *temperature sensor is secured by welding directly in the semiconductor laser chip*. Accordingly, the Kim reference does not identically disclose or even suggest the features of claim 16. Withdrawal of the rejection of claim 16 under 35 U.S.C. §102(b) is respectfully requested.

Since claim 23 depends from amended claim 16, claim 23 is allowable for at least the same reasons as claim 16.

Regarding paragraphs six (6) and seven (7) of the Office Action, claims 17 and 18 were rejected under 35 U.S.C. §103(a) as being unpatentable over the Kim reference.

Claims 17 and 18 have been canceled. Accordingly, this rejection is moot. Even though claim 16 has been amended to include the features of claims 17 and 18, it is respectfully submitted that claim 16 is not rendered obvious by the Kim reference. As discussed above, the Kim reference does not describe or suggest at least one temperature sensor configured to be integrated in the semiconductor laser chip for *measuring* an operating temperature, and the at least one *temperature sensor is secured by welding directly in the semiconductor laser chip*, as in claim 16. Further, Applicants respectfully submit that the Kim reference is directed towards a different art and invention -- utilizing a PTC resistor (*not* a temperature sensor) as a heat and/or control element(*not* as a temperature sensor to measure an operating temperature)...and replaces the employed "mounting column" on which a laser chip is usually mounted and which usually acts as a heat sink." See col. 2, lines 45-50. As indicated in the Kim reference, the PTC resistor, shown in Figure 1(a) which was cited to by the Office Action, does not even serve as a temperature sensor... and instead additional hardware is necessary to add to the PTC resistor arrangement. See col. 2, lines 45-60. Accordingly, the Kim reference does not describe or even suggest the features of claim 16.

Regarding paragraph eight (8) of the Office Action, claim 26 was rejected under 35 U.S.C. §103(a) as being unpatentable over the Kim reference.

The Kim reference purportedly concerns a modified semiconductor laser diode having an integrated temperature control element. See Title. The Kim reference refers to its diode arrangement as having at least one laser chip, heating provided by at least one PTC resistor such that a device operational temperature is controlled by this PTC resistor, a detector for determining the radiation emerging from the rear of the laser chip, an NTC resistor or a

thermo-element for measuring the chip temperature. See Abstract. The Kim reference further refers to the laser chip as serving a dual function of acting as a laser source and as a radiation detector. See Abstract. Figure 1(a) of the Kim reference is referred to as having a miniaturized PTC (a posistor utilized as heat and/or control element) brought into thermal contact with the laser chip – in comparison to conventional laser diodes, the PTC replaces the employed "mounting column" on which the laser chip usually is mounted and which usually acts as a heat sink. See col. 2, lines 21-23 and 45-50.

Claim 26, as now rewritten, recites:

A semiconductor laser comprising:

at least one first semiconductor laser chip;

at least one second semiconductor laser chip, the at least one second semiconductor laser chip forming a semiconductor laser array with the at least one first semiconductor laser chip;

at least one temperature sensor associated with the semiconductor laser chip for measuring an operating temperature, each of the at least one temperature sensor being one of disposed directly on and integrated in a respective one of the semiconductor laser chip and the at least one second semiconductor laser chip for measuring a respective operating temperature, an operating temperature of the semiconductor laser array being measurable by measuring the operating temperature of the at least one first semiconductor laser chip and the at least one second semiconductor laser chip, a respective output wavelength of the semiconductor laser chip and the at least one first semiconductor laser chip and at least one of the second semiconductor laser chip being adjustable by varying their respective pumping currents.

In contrast, the Kim reference does not describe or suggest at least the features of an at least one second semiconductor laser chip *forming a semiconductor laser array* with the at least one first semiconductor laser chip; at least one temperature sensor associated with the semiconductor laser chip for measuring an operating temperature, each of the at least one *temperature sensor being one of disposed directly on and integrated in a respective one of the semiconductor laser chip and the at least one second semiconductor laser chip for measuring a respective operating temperature*, as in claim 26. As discussed above, the Kim reference does not describe or suggest at least one temperature sensor configured to be integrated in or disposed on the semiconductor laser chip or a semiconductor laser array, as in claim 26. Further, Applicants respectfully submit that the Kim reference is directed towards a different art and invention -- utilizing a PTC resistor (*not* a temperature sensor) as a heat and/or control element(*not* as a temperature sensor to measure an operating temperature). See col. 2, lines 45-50. As indicated in the Kim reference, the PTC resistor, shown in Figure

1(a) which was cited to by the Office Action, does not even serve as a temperature sensor... and instead additional hardware is necessary to add to the PTC resistor arrangement. See col. 2, lines 45-60. Accordingly, the Kim reference does not describe or even suggest the features of claim 26. Withdrawal of the rejection of claim 26 under 35 U.S.C. §103(a) over the Kim reference is respectfully requested.

New claims 34 to 51 contain analogous features to claims 16 and 19 to 33; accordingly, it is respectfully submitted that those claims are also allowable over the art cited in the Office Action for essentially the same reasons as for claims 16 and 19 to 33. No new matter has been added.

In summary, it is respectfully submitted that all of claims 16 to 51 of the present application are allowable for the foregoing reasons.

CONCLUSION

In view of all of the above, it is believed that the rejections of claims 16 and 19 to 33 have been obviated. Further, it is believed that claims 34 to 51 are also allowable over the art cited by the Office Action. Accordingly, it is respectfully submitted that all claims 16 to 51 are allowable.

It is therefore respectfully requested that the rejections be reconsidered and withdrawn, and that the present application issue as early as possible.

Respectfully submitted,
KENYON & KENYON

By: Quida M. Shudy
Reg. No. 47084

Dated: March 13, 2003

By: Richard L. Mayer
Richard L. Mayer
(Reg. No. 22,490)

CUSTOMER NO. 26646

One Broadway
New York, NY 10004
(212) 425-7200

VERSION SHOWING CHANGES MADE

IN THE CLAIMS:

Please cancel without prejudice claims 17 and 18.

Please amend without prejudice claims 16, 19, 21, 26 and 32 as follows:

16. (Twice amended) A semiconductor laser comprising:

a semiconductor laser chip; and

at least one temperature sensor configured to be [one of disposed directly on and] integrated in the semiconductor laser chip for measuring an operating temperature,

wherein the at least one temperature sensor is secured by welding directly in the semiconductor laser chip, an energy for the welding coming from a light source, the light source including at least one of a ND-glass source, a Nd-YAG source and a source having a similar spatial distribution and similar spectral distribution to a Nd-glass source or a Nd-YAG source.

19. (Amended) The semiconductor laser as recited in claim [17] 16 wherein prior to the welding each of the at least one temperature sensor is sealed into an electrically insulating glass.

21. (Amended) The semiconductor laser as recited in claim 16 wherein the at least one temperature sensor is [in] included in the semiconductor laser chip, wires for measuring an electrical resistance through the semiconductor laser chip being mounted on the semiconductor laser chip.

26. (Amended) [The] A semiconductor laser [as recited in claim 16 further] comprising:

at least one first semiconductor laser chip;

at least one second semiconductor laser chip, the at least one second semiconductor laser chip forming a semiconductor laser array with the at least one first semiconductor laser chip;

at least one temperature sensor associated with the semiconductor laser chip for measuring an operating temperature, each of the at least one temperature sensor[s] being one

<u>of</u> disposed directly on <u>and</u> [or] integrated in a respective one of the semiconductor laser chip and the at least one second semiconductor laser chip for measuring a respective operating temperature, an operating temperature of the semiconductor laser array being measurable by measuring the operating temperature of the <u>at least one first</u> semiconductor laser chip and [of each of] the at least one second semiconductor laser chip, a respective output wavelength of the semiconductor laser chip and [of each of] the at least one <u>first</u> semiconductor laser chip <u>and at least one of the second semiconductor laser chip</u> being adjustable by varying their respective pumping currents.

32. (Amended) The semiconductor laser as recited in claim 16 <u>further comprising:</u>

[wherein the measured operating temperature is used in] a closed-loop control circuit including a setter for adjusting the operating temperature.

Please add without prejudice new claims 34-51 as follows:

34. (New) A semiconductor laser comprising:

a semiconductor laser chip; and

at least one temperature sensor configured to be disposed directly on the semiconductor laser chip for measuring an operating temperature,

wherein the at least one temperature sensor is secured by welding directly on the semiconductor laser chip, an energy for the welding coming from a light source, the light source including at least one of a ND-glass source, a Nd-YAG source and a source having a similar spatial distribution and similar spectral distribution to a Nd-glass source or a Nd-YAG source.

35. (New) The semiconductor laser as recited in claim 35 wherein prior to the welding each of the at least one temperature sensor is sealed into an electrically insulating glass.

36. (New) The semiconductor laser as recited in claim 34 wherein each of the at least one temperature sensor is arranged and secured in a respective hole, each of the respective hole being formed in the laser chip using light-welding.

VERSION SHOWING CHANGES MADE

37. (New) The semiconductor laser as recited in claim 34 wherein the at least one temperature sensor is included in the semiconductor laser chip, wires for measuring an electrical resistance through the semiconductor laser chip being mounted on the semiconductor laser chip.

38. (New) The semiconductor laser as recited in claim 39 wherein the wires for measuring the electrical resistance through the semiconductor laser chip include a pumping current lead wire and an additional wire used as a sensor supply lead.

39. (New) The semiconductor laser as recited in claim 34 wherein the at least one temperature sensor includes a thermoelement.

40. (New) The semiconductor laser as recited in claim 34 wherein the at least one temperature sensor includes a thermoelement having two wires joined by laser-light welding and secured in a common work step to the semiconductor laser chip.

41. (New) The semiconductor laser as recited in claim 42 wherein a contact surface of a material of one of the wires is deposited on the semiconductor laser chip before the two wires are joined.

42. (New) The semiconductor laser as recited in claim 34 wherein each of the at least one temperature sensor includes a respective thermoelement disposed directly on the semiconductor laser chip, each of the thermoelements being operatable in a reversed operation as a respective Peltier element having a current source for adjusting a respective temperature with local selectivity.

43. (New) The semiconductor laser as recited in claim 27 wherein the semiconductor laser chip includes an active laser zone having at least one measuring point for measuring a wavelength of the semiconductor laser chip so as to enable an adjusting of the wavelength.

44. (New) The semiconductor laser as recited in claim 28 wherein the semiconductor laser is

included in a telecommunications laser and the semiconductor laser chip includes one measuring point in the active zone.

45. (New) The semiconductor laser as recited in claim 45 wherein the semiconductor laser is included in a high-performance laser and the semiconductor laser chip includes a plurality of measuring points along the active laser zone.

46. (New) The semiconductor laser as recited in claim 44 wherein the at least one temperature sensor includes at least two thermoelements operated and configured in a cascade arrangement.

47. (New) The semiconductor laser as recited in claim 34 further comprising a respective temperature setter and a respective temperature controller associated with each of the at least one temperature sensor and disposed on the semiconductor laser chip.

48. (New) The semiconductor laser as recited in claim 26 wherein the at least one temperature sensor is disposed directly on the semiconductor laser chip for measuring an operating temperature.

49. (New) The semiconductor laser as recited in claim 26 wherein the at least one temperature sensor is integrated in the semiconductor laser chip for measuring an operating temperature.

50. (New) The semiconductor laser as recited in claim 32 wherein the at least one temperature sensor is disposed directly on the semiconductor laser chip for measuring an operating temperature.

51. (New) The semiconductor laser as recited in claim 32 wherein the at least one temperature sensor is integrated in the semiconductor laser chip for measuring an operating temperature.